AN3166
Application note

How to migrate from STEVAL-IHP001V2 to STEVAL-IHP001V3

Introduction

The purpose of this document is to guide the user in the upgrade process of the STEVAL-IHP001V2, moving it to the STEVAL-IHP001V3 version.

Regarding the hardware, both v2 and v3 versions of the smartplug demonstration boards are identical. STEVAL-IHP001V3 differs from the previous v2 version in terms of the ZigBee® PRO stack update. In addition to the ZigBee PRO stack features, this update allows to use STEVAL-IFS013V2 USB-ZigBee dongle as a network coordinator.

The document describes in detail the steps to follow in order to move the STEVAL-IHP001V2 to the new STEVAL-IHP001V3.

For further details on the smartplug STEVAL-IHP001V2 demonstration board please refer to the AN2993 application note.

Contents

1 **Document and library rules 4**
1.1 Abbreviations 4

2 **Upgrade procedure 5**
2.1 Introduction 5
2.2 Step 1: upgrade SPZB260 to SPZB260-PRO 6
2.3 Step 2: upgrade STEVAL-IHP001V2 application 6
2.4 Step 3: upgrade STEVAL-IFS013V2 application 7

3 **References 9**

4 **Schematics and BOM list 10**

5 **Revision history 23**

List of figures

Figure 1. SPZB260-PRO module . . . 6
Figure 2. STEVAL-IHP001V2 smartplug demonstration board . . . 7
Figure 3. STEVAL-IFS013V2 evaluation board . . . 7
Figure 4. PC GUIs available to show ZigBee smartplug network features: external official GUI . . . 8
Figure 5. PC GUIs available to show ZigBee smartplug network features: internal demo GUI . . . 8
Figure 6. DfuSe demo tool to upload firmware . . . 8
Figure 7. AC load driver page . . . 10
Figure 8. Configuration jumpers page . . . 11
Figure 9. Temperature sensor and connectors page . . . 12
Figure 10. Microcontroller page . . . 13
Figure 11. Energy meter IC page . . . 14
Figure 12. Differential current meter page . . . 15
Figure 13. AC-DC converter page . . . 16
Figure 14. DC-DC converter page . . . 17

1 Document and library rules

This document uses the conventions described in the sections below.

1.1 Abbreviations

Table 1 describes the abbreviations used in this document.

Table 1. List of abbreviations

Abbreviations	Meaning
STEVAL-IHP001V2	Smartplug demonstration board version 2
STEVAL-IHP001V3	Smartplug demonstration board version 3
STEVAL-IFS013V2	ZigBee USB dongle based on STM32 and SPZB260-PRO
Dfu	Device firmware update
MCU	Microcontroller unit

2 Upgrade procedure

2.1 Introduction

In order to proceed with the smartplug system update, the following items are needed:

- STEVAL-IHP001V2 board
- A JTAG tool to update a binary file on the STM32F103 microcontroller (like ST-link, J-Link or similar)
- STEVAL-IFS013V2 board to be used as smartplug coordinator
- DfuSe demonstration tool provided by STMicroelectronics (it comes in the CD distributed inside the STEVAL-IFS013V2 package) in order to upload the STEVAL-IFS013V2 board with the smartplug coordinator application
- The STEVAL-IHP001V3 upgrade package distributed with this AN, including the following files:
  - Smartplug ZigBee Stack PRO Update 3_3_25.bin
  - SmartPlug App V3 revA.bin
  - SmartPlug App V3 revB.bin
  - IFS013V2 smartplug coordinator PRO - INT.dfu
  - IFS013V2 smartplug coordinator PRO - EXT.dfu

The upgrade procedure consists of the following steps:

- Step 1: upgrade SPZB260 to SPZB260-PRO
- Step 2: upgrade STEVAL-IHP001V2 application firmware
- Step 3: upgrade STEVAL-IFS013V2 application firmware

Warning: **The STEVAL-IHP001V2 board must be used only by expert technicians. Due to the high voltage (220 V - 110 VAC) special care should be taken with regard to human safety. There is no protection against high voltage accidental human contact. After disconnection of the board from the mains, none of the live parts should be touched immediately because of the energized capacitors. It is mandatory to use a mains insulation transformer to perform any firmware upload/debugging/tests on the board in which debugging and test instruments like USB-JTAG dongles, spectrum analyzers or oscilloscopes are used. Do not connect any oscilloscope probes to high voltage sections in order to avoid damaging instruments and demonstration tools. ST assumes no responsibility for any consequences which may result from the improper use of this tool.**

2.2 Step 1: upgrade SPZB260 to SPZB260-PRO

The ZigBee module SPZB260 is assembled on the STEVAL-IHP001V2. In order to use the new smartplug V3 application, update the SPZB260 ZigBee stack. This upgrades SPZB260 to SPZB260-PRO obtaining ZigBee PRO stack compliancy.

Implement the following steps in order to upgrade SPZB260 to SPZB260-PRO:

1. Use the JTAG tool to upload STEVAL-IHP001V2 with the binary file smartplug ZigBee stack PRO update 3_3_25.bin found in the package distributed with this AN
2. Reset the board: the new running application starts to upload the stack version on SPZB260. During the upload process, green and yellow LEDS on the STEVAL-IHP001V2 indicate the process status:
   - LED green is on: process initialization OK
   - LED green blinks every half a second and LED yellow is off: upload in progress
   - LED green and yellow stay off: upload failed
   - LEDs green and yellow blink alternatively every quarter of a second: upload process completed with success

Figure 1. SPZB260-PRO module

AM06582v1

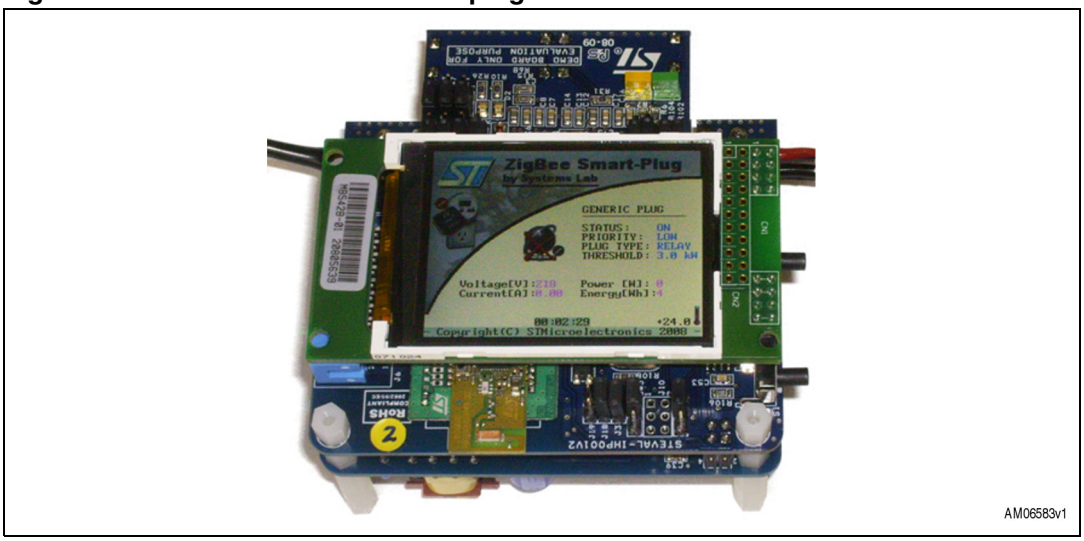
2.3 Step 2: upgrade STEVAL-IHP001V2 application

Implement the following steps in order to upgrade STEVAL-IHP001V2 to the STEVAL-IHP001V3 application:

1. Make sure that green and yellow LEDs are alternatively blinking, indicating SPZB260-PRO upload process has been completed with success
2. Use your JTAG tool to upload STEVAL-IHP001V2 with the binary file smartplug App V3 revA.bin or smartplug App V3 revB.bin according to the STEVAL-IHP001V2 revision (A or B) (see *Note: 1*)
3. Reset the board: the new STEVAL-IHP001V3 application is running on the board. The LCD shows a header with the v3 version

Note: 1 A or B revision depends on the LCD version assembled onboard: Rev.A is related to boards bought before 1st October 2009 and comes with MB542 B01 rev.C LCD. Rev.B is related to boards bought after 1st October 2009 and comes with MB542 B02 rev.B LCD.

Figure 2. STEVAL-IHP001V2 smartplug demonstration board



2.4 Step 3: upgrade STEVAL-IFS013V2 application

Implement the following steps in order to upgrade STEVAL-IFS013V2 with the smartplug network coordinator application:

1. The STEVAL-IFS013V2 board comes with a CD containing the right driver installation. So, if not yet done, it is necessary to execute the VCPDriver_v1.1_setup.exe driver setup file before connecting the dongle to the PC
2. The same STEVAL-IFS013V2 CD contains also the Dfu software to be used in order to upgrade the firmware onboard. So, if not yet done, it is necessary to execute the DfuSe_Demo_V3.0_Setup.exe software setup file in order to install the DfuSe demonstration PC tool
3. Two different Dfu files are available for STEVAL-IFS013V2 upload in order to support two different GUIs running on the PC and used to show all the features of the ZigBee smartplug network. An external and official GUI is available on the ST reference design boards internet/intranet page. An internal GUI (only on request for internal and marketing use) with a more attractive look is also available for customer demonstrations and demo events:
   - FS013V2 smartplug coordinator PRO - INT.dfu (supporting internal GUI)
   - FS013V2 smartplug coordinator PRO - EXT.dfu (supporting external GUI)

Figure 3. STEVAL-IFS013V2 evaluation board

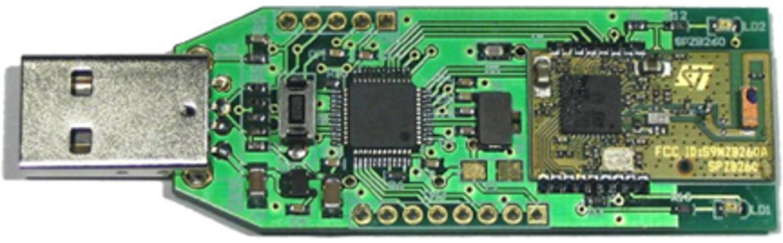
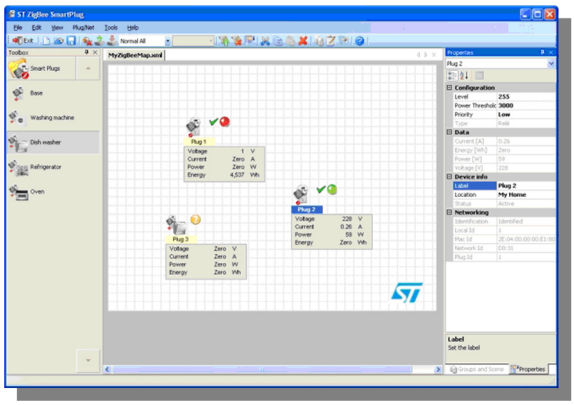


Figure 4. PC GUIs available to show ZigBee smartplug network features: external official GUI



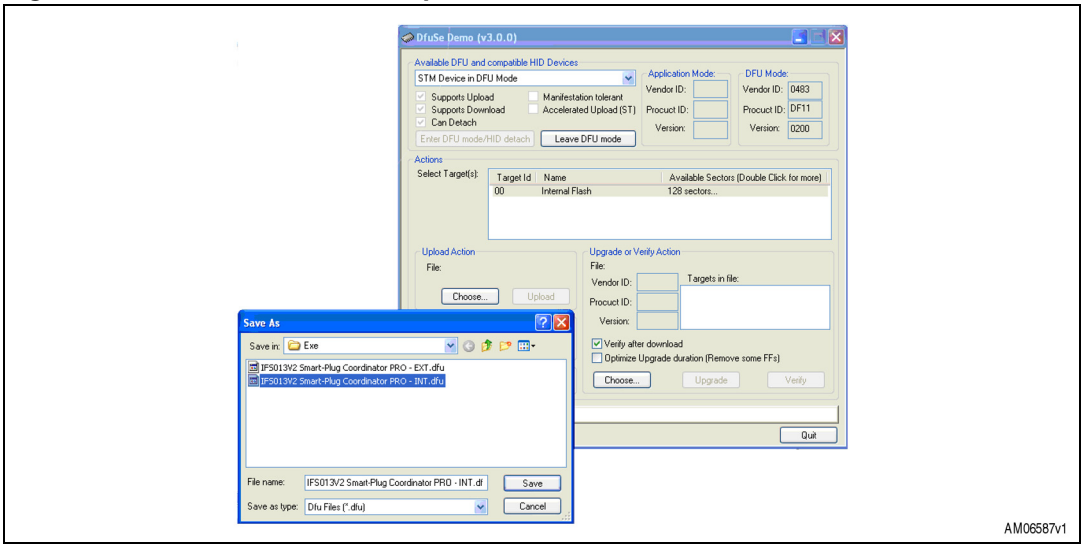
AM06585v1

Figure 5. PC GUIs available to show ZigBee smartplug network features: internal demo GUI

AM06586v1

4. Keeping the STEVAL-IFS013V2 button pressed, insert it in the PC USB port. Release the button. Now the original application running on STEVAL-IFS013V2 has started in Dfu mode. At this point use the DfuSe demonstrator software to update the ZigBee dongle firmware.

Figure 6. DfuSe demo tool to upload firmware



AM06587v1

5. If the upload procedure has been completed successfully, remove the STEVAL-IFS013V2 dongle from the PC and insert it again without pressing the button on the board. After the firmware application starts to run, the button to force the ZigBee network synchronization can be used. The right PC-GUI can be run and worked with (See note *2*).

2 The internal demo PC-GUI has a limitation on the COM port associated to the dongle. The associated COM port must be between 1 and 9. If the assigned COM port is >9 it must be set manually on the PC before using the internal demo GUI.

3 References

1. AN2993 application note
2. UM0608 user manual
3. STEVAL-IHP001V3 section
4. STEVAL-IFS013V2 section

4 Schematics and BOM list

Figure 7. AC load driver page

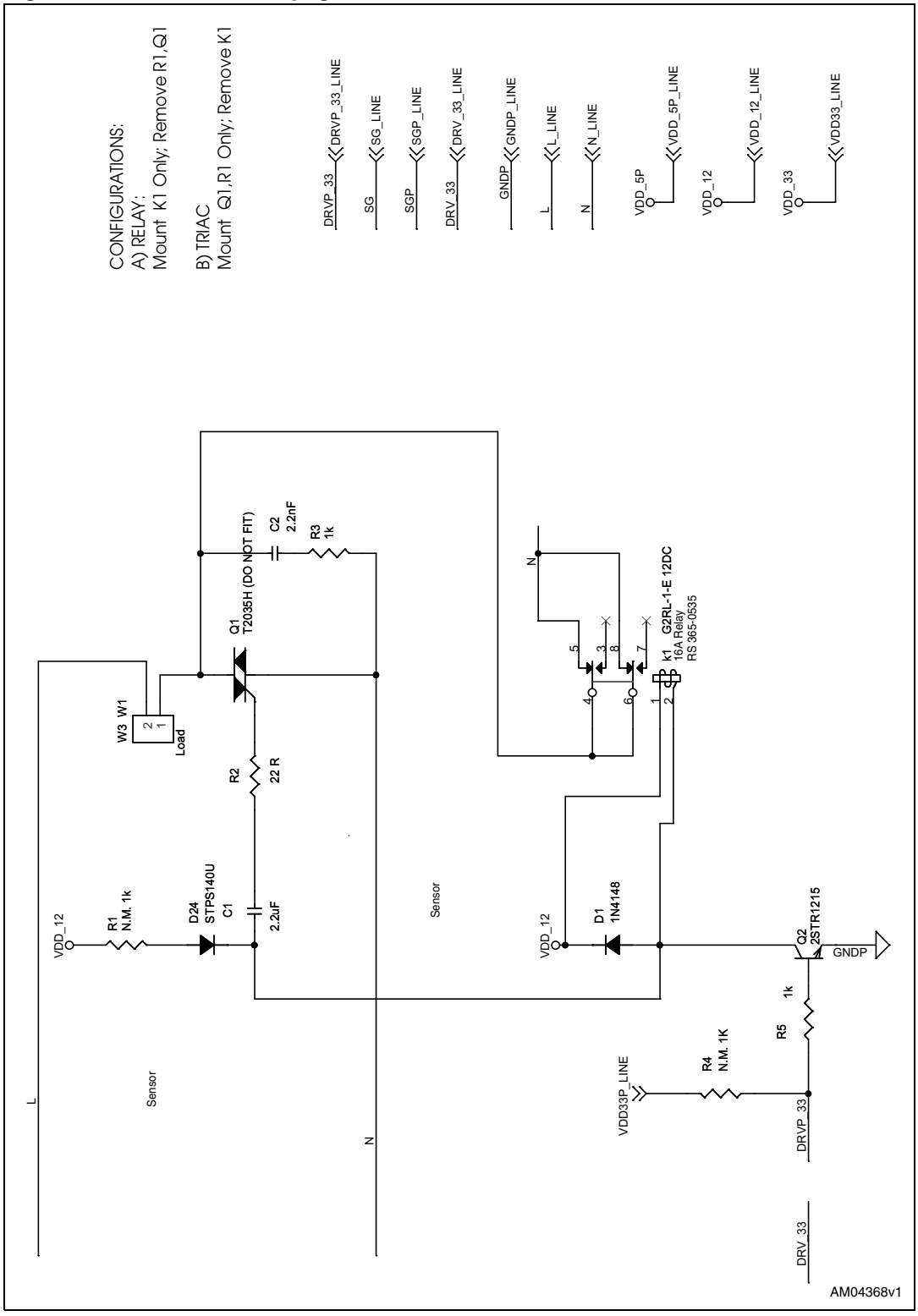


Figure 8. Configuration jumpers page

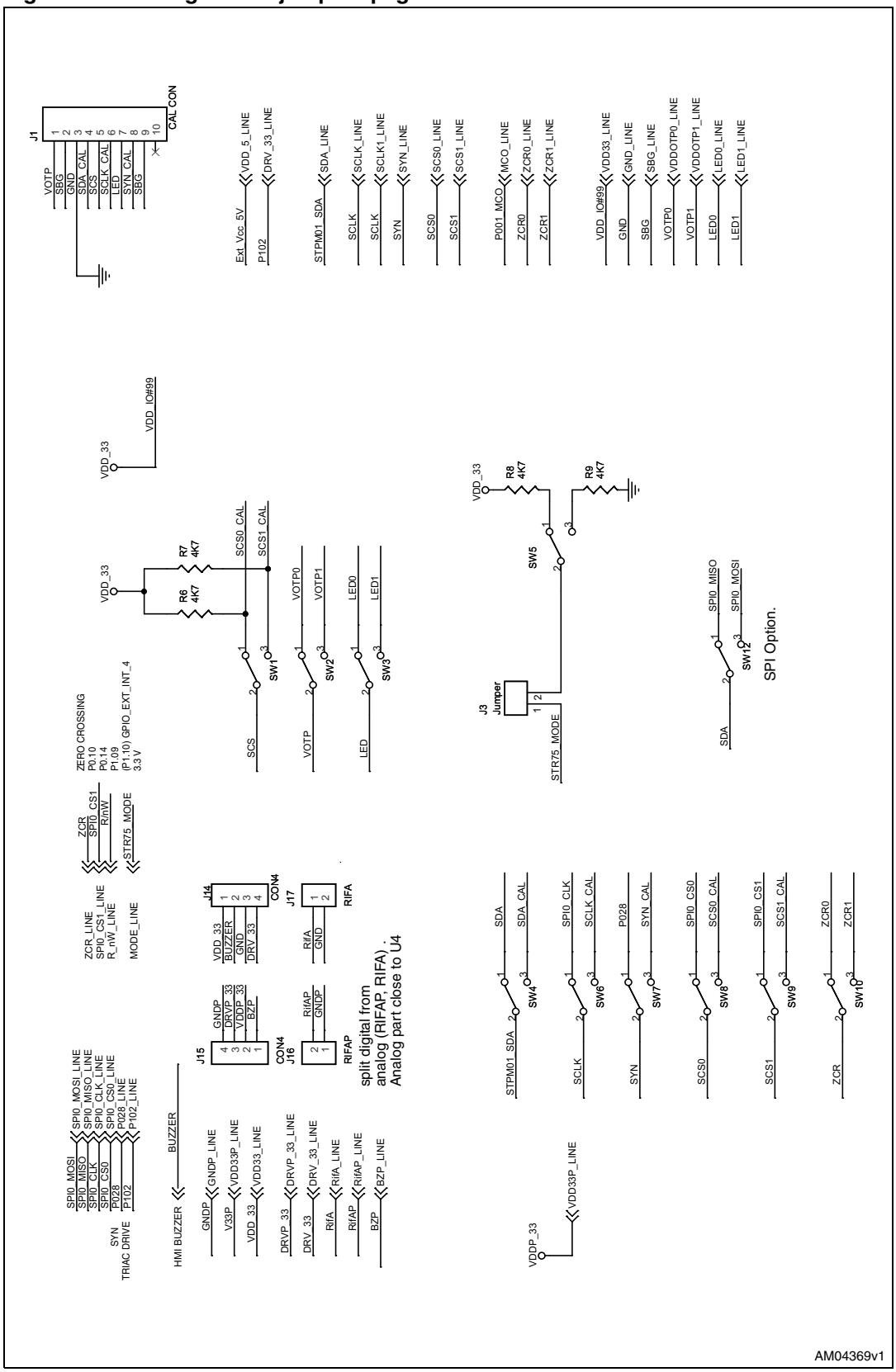


Figure 9. Temperature sensor and connectors page

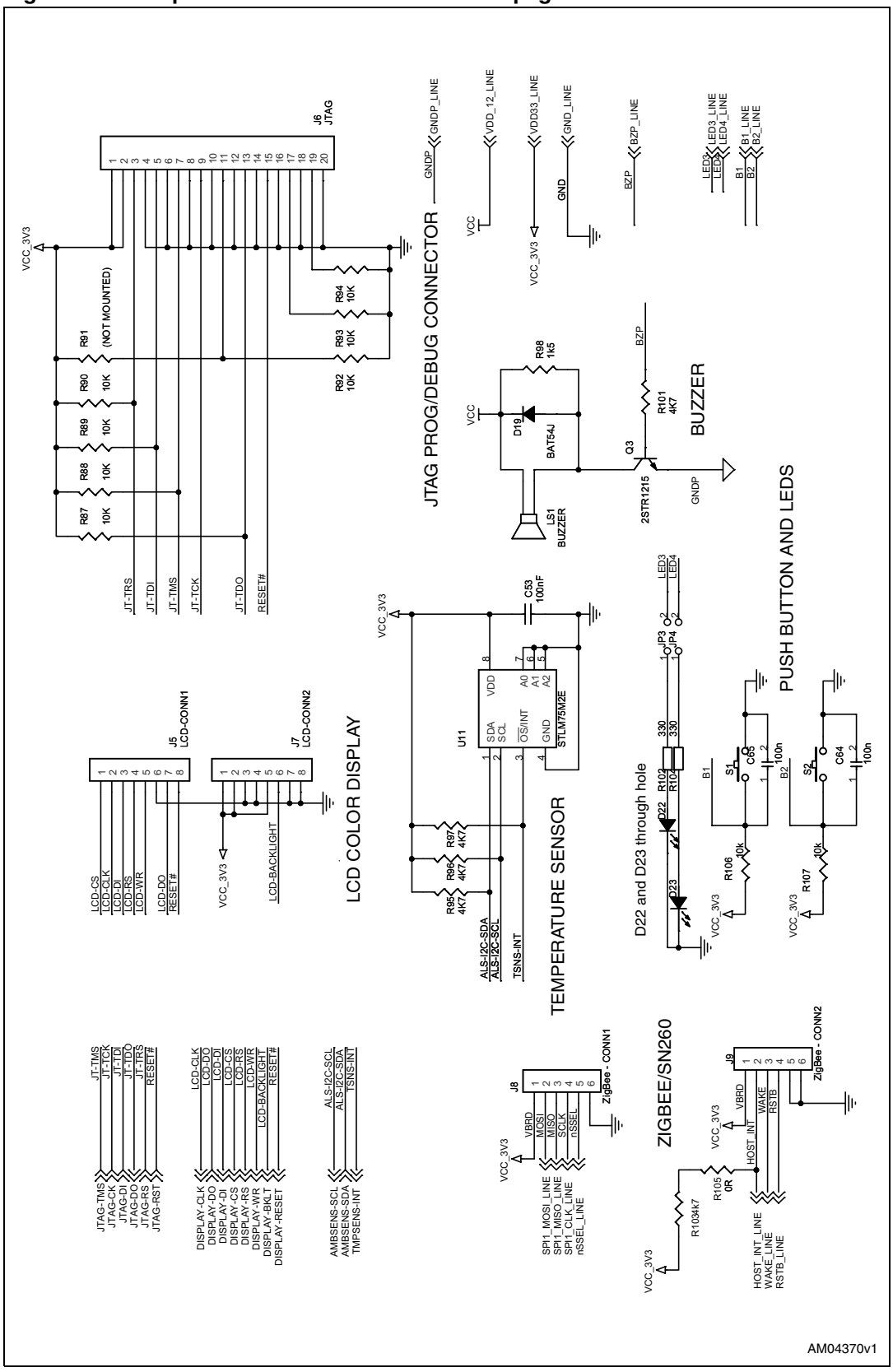


Figure 10. Microcontroller page

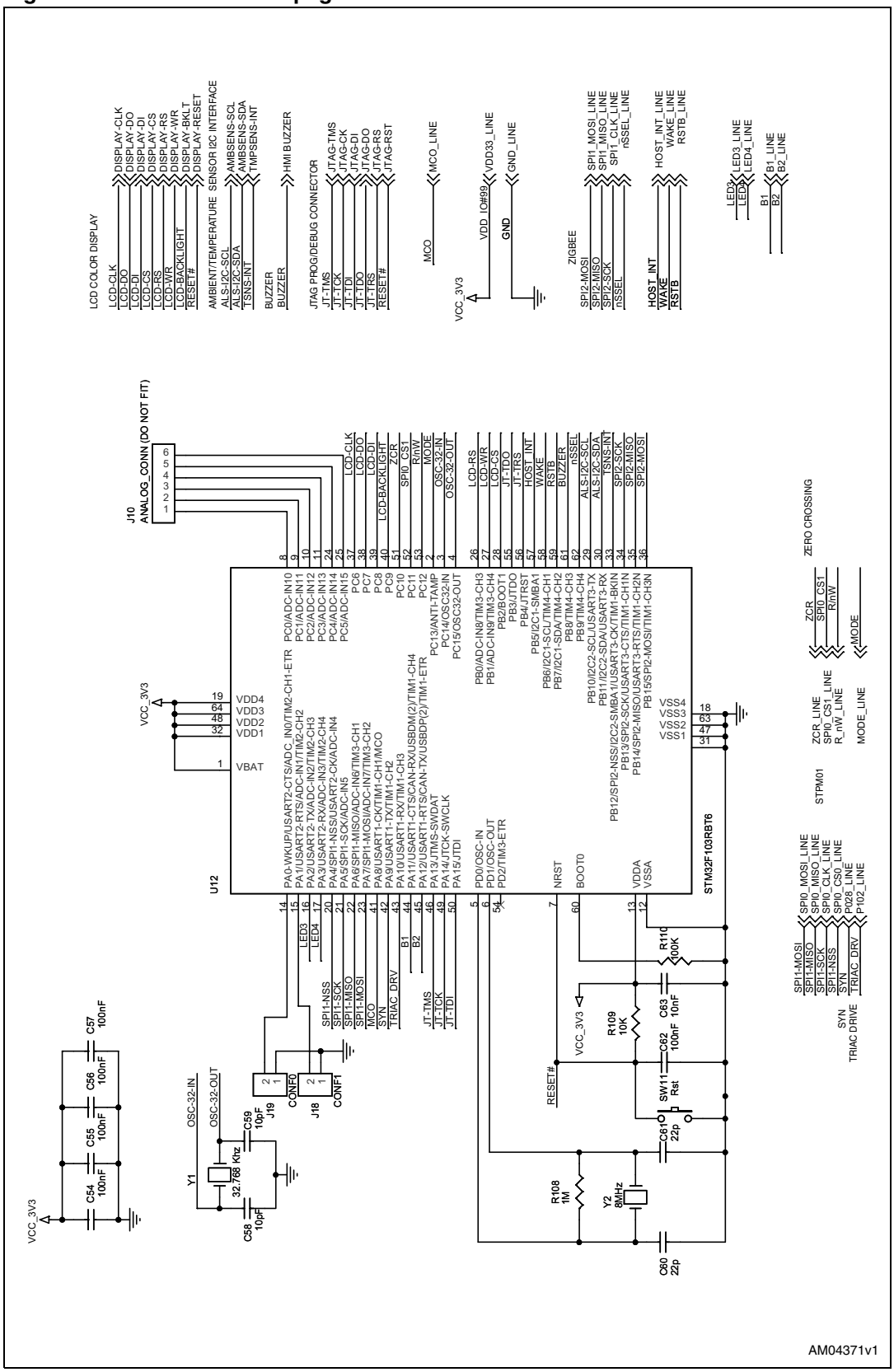


Figure 11. Energy meter IC page

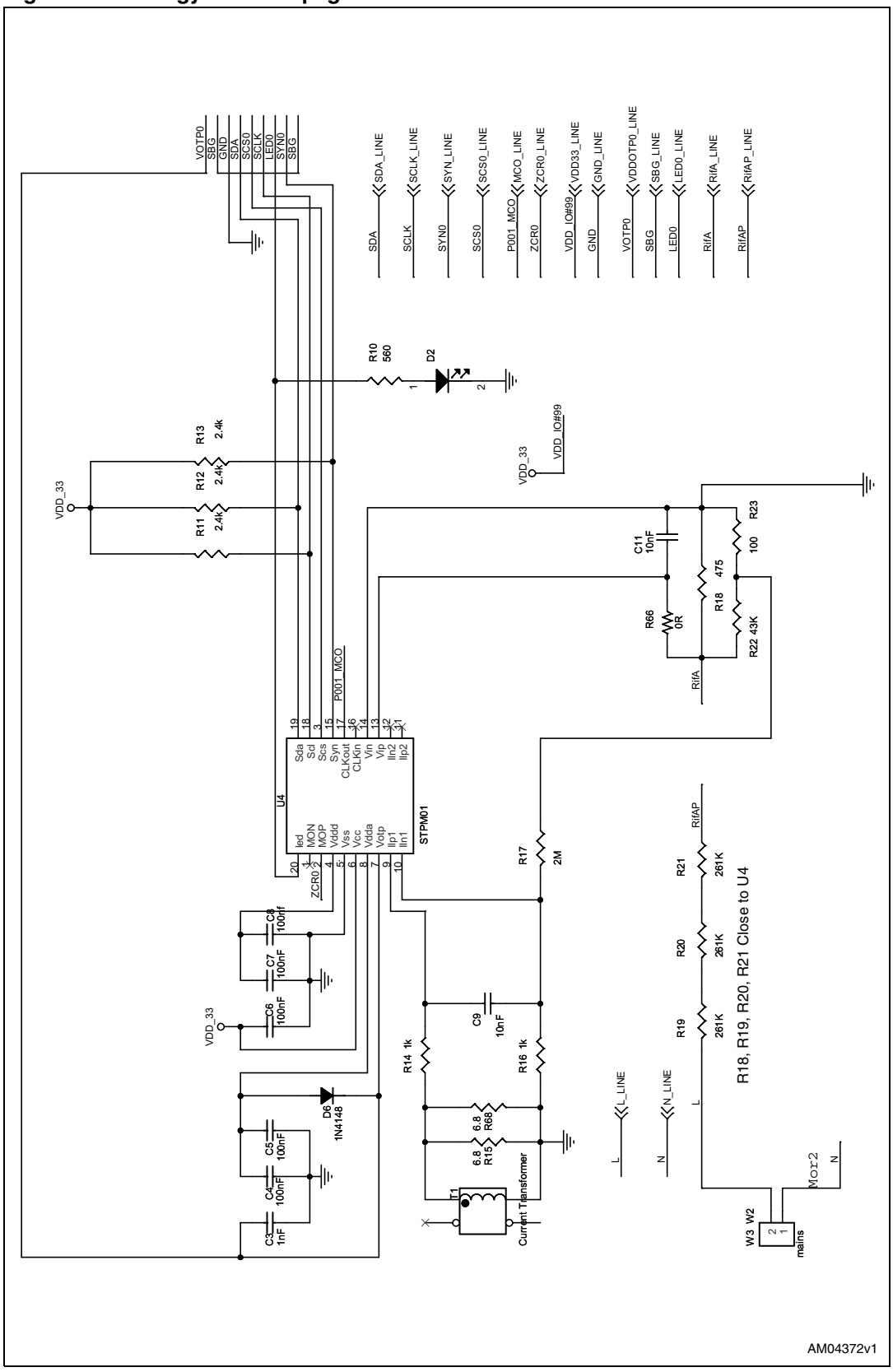


Figure 12. Differential current meter page

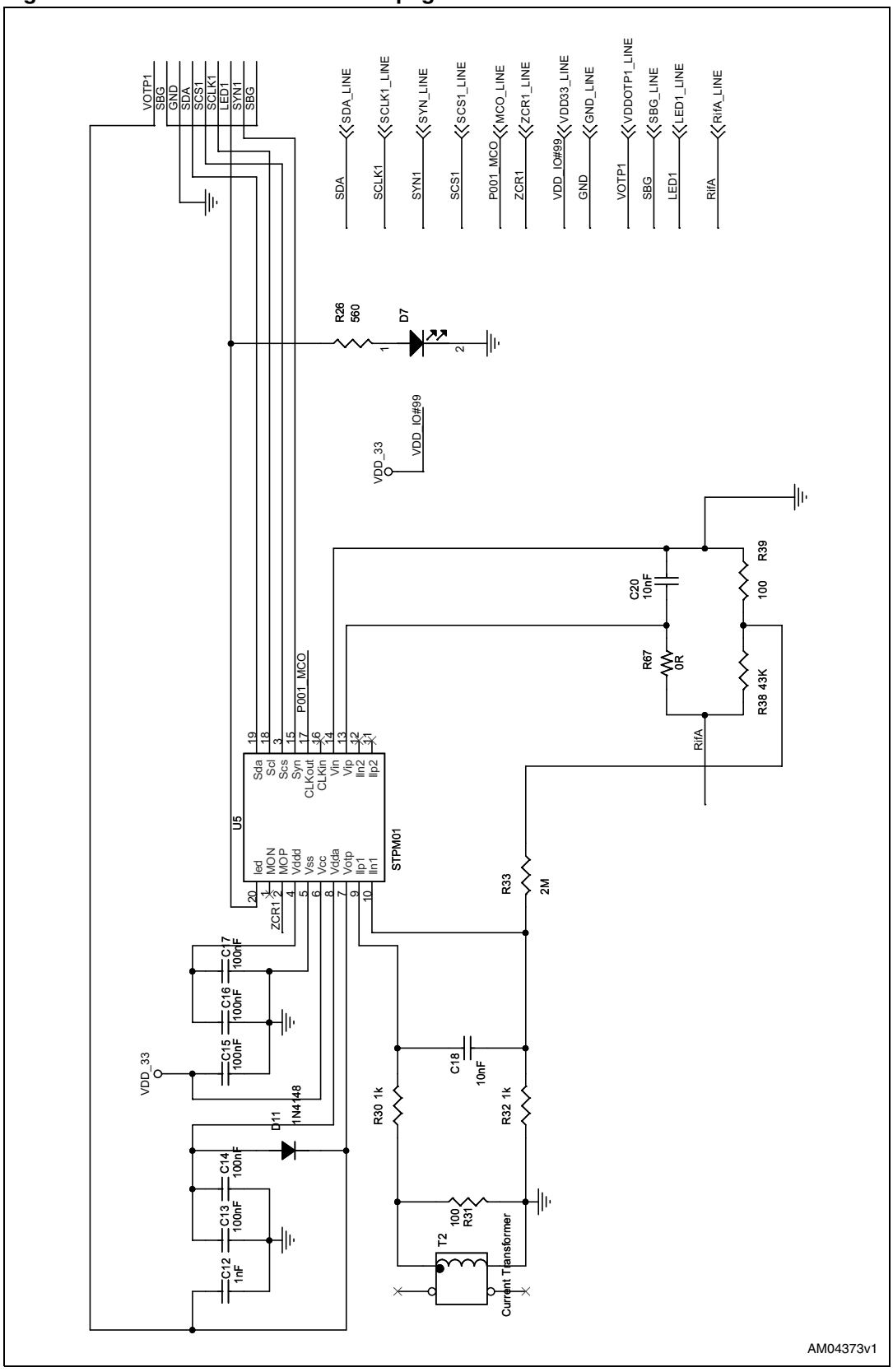


Figure 13. AC-DC converter page

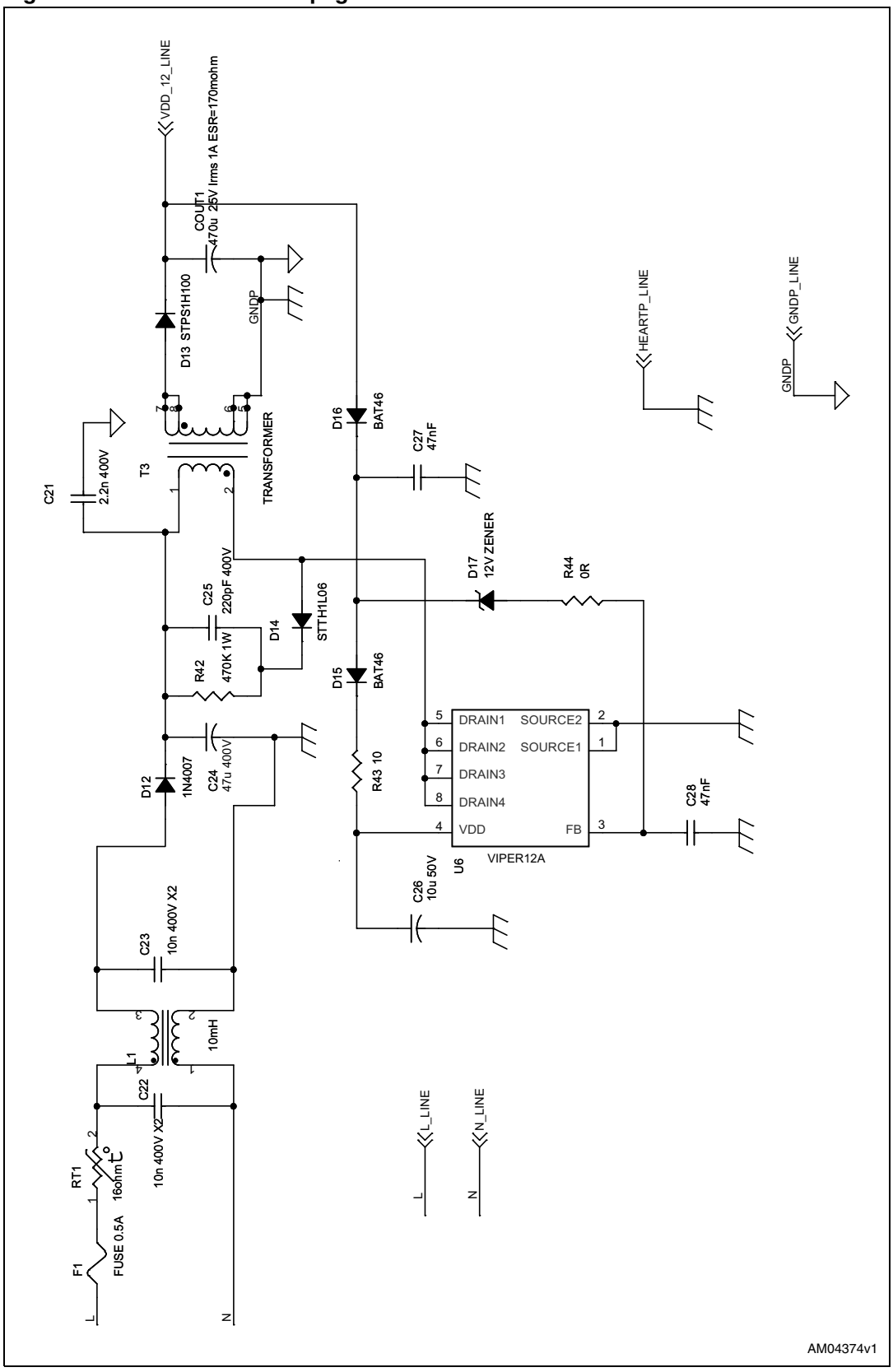


Figure 14. DC-DC converter page

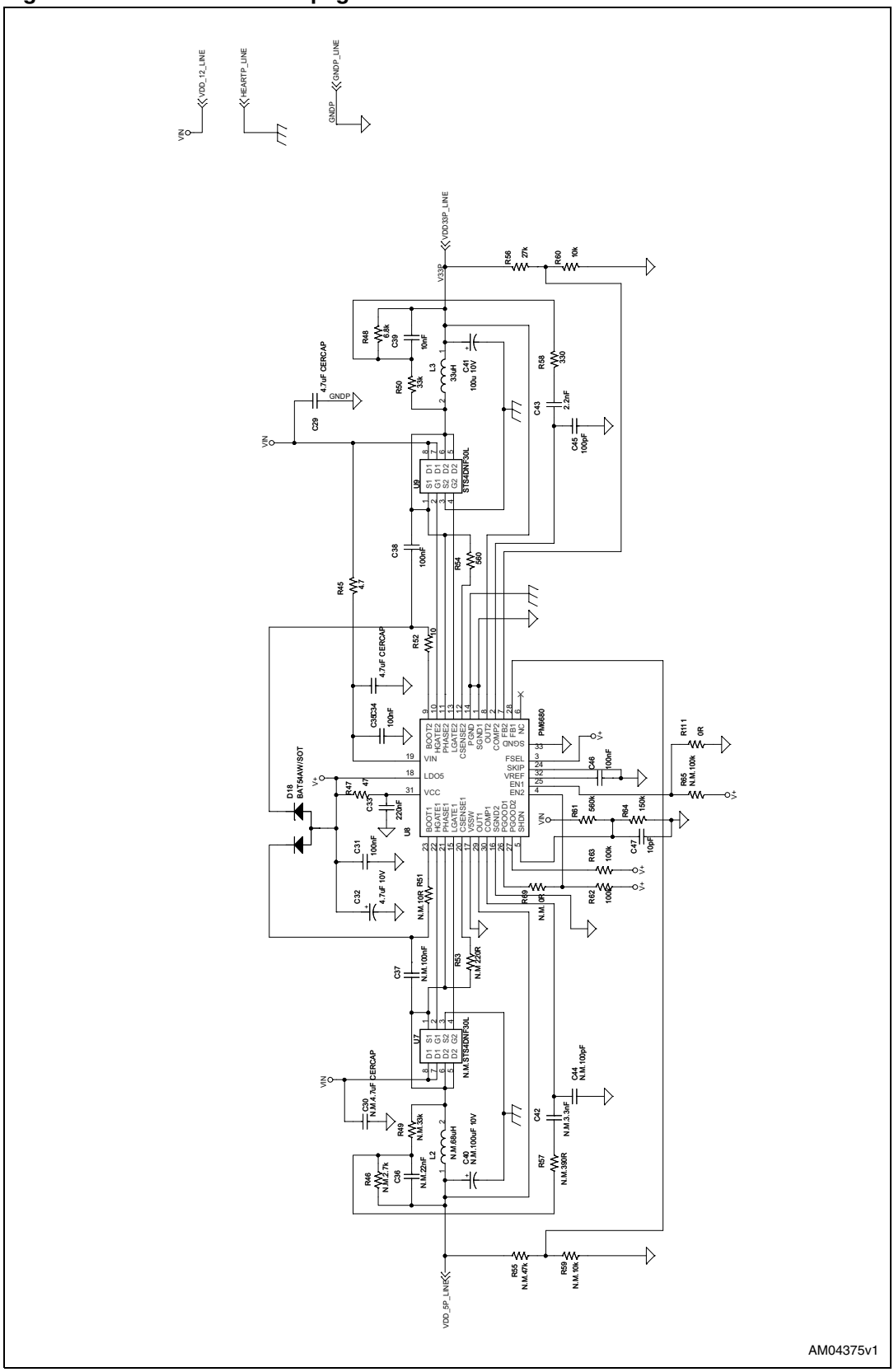


Table 2. BOM list

Reference	Part / value	Voltage / Watt	Footprint	Manuf.	Manuf. code	RS code	More info
COUT1	470 µF 25 V Irms 1 A ESR=170 mohm	25 V electrolytic	Radial			315-0574	Height 16 mm
C1	2.2 µF	16 V ceramic	SMD/ 0805				
C2	47 nF						
C3,C12	1 nF	16 V ceramic	SMD/ 0805				
C4,C5,C6,C7,C8,C13,C14 ,C15,C16,C17,C31,C35, C38,C46,C53,C54,C55, C56,C57,C62	100 nF	16 V ceramic	SMD/ 0805				
C9,C11,C18,C20,C39,C6 3	10 nF	16 V ceramic	SMD/ 0805				
C21	2.2 nF 400 V	400 V ceramic					
C22,C23	10 nF 400 V X2	400 V				441-9616	
C24	47 µF 400 V	400 V electrolytic	Radial			434-0330	
C25	220 pF 400 V	400 V ceramic					
C26	10 µF 50 V	Electrolytic	Radial				
C27,C28	47 nF	16 V ceramic	SMD/0805				
C29,C34	4.7 µ CERCAP	16 V ceramic	SMD/ 0805				
C32	4.7 µ 10 V	10 V tantalum	SMD			533-9126	
C33	220 nF	16 V ceramic	SMD/0805				
C41	100 µF 10 V	10 V tantalum	SMD			464-7877	
C43	2.2 nF	16 V ceramic	SMD/ 0805				
C45	100 pF	16 V ceramic	SMD/0805				
C47,C58,C59	10 pF	16 V ceramic	SMD/0805				

Table 2. BOM list (continued)

Reference	Part / value	Voltage / Watt	Footprint	Manuf.	Manuf. code	RS code	More info
C60,C61	22 pF	16 V ceramic	SMD/0805				
C64,C65	100 nF	16 V ceramic	SMD/0805				
C30,C36,C37,C40,C42, C44,J10, L2 R1,R4,R69,R46,R49,R51, R53, R55,R57,R59,R65,R69, R91,U7,	Not assembled						Not assembled
D2,D7	LED -LGR971		SMD/0805			654-5773	
D1,D6,D11	LL1N4148		SMD				
D12	1N4007		With terminal				
D13	STPS1H100		SMD	STMicroelectronics			
D14	STTH1L06		SMD	STMicroelectronics			
D15,D16	BAT46W		SOT/23	STMicroelectronics			
D17	12 V Zener 0.5 W		SMD				
D18	BAT54AW/ SOT		SOT/23	STMicroelectronics			
D19	BAT54J		SMD				
D22	Rectangular LED 2x5	Green	With terminal			171,6807	
D23	Rectangular LED 2x5	Yellow	With terminal			171-6784	
D24	STPS140U			STMicroelectronics			
F1	FUSE 0.5 A		With terminal			226-0591	
J1	Ampmode-10 pin					461-663	
J6	Male connector 90° 20 pin					461-691	
J5-J7	Female double stripline 8 pin						

Table 2. BOM list (continued)

Reference	Part / value	Voltage / Watt	Footprint	Manuf.	Manuf. code	RS code	More info
J14	Male double stripline 4 pin						
J15	Female double stripline 4 pin low profile			KONTEK		230-4950	
J3,J17,J18,J19,JP3,JP4	Male single stripline 2 pin						
J16	Female single stripline 2 pin low profile			KONTEK		230-4938	
LS1	Buzzer					511-7670	
L1	10 mH	Filter inductor				489-0245	
L3	33 µH 1.3 A		SMD	Coilcraft	LPS6235-333ML		
Q1	Triac T2035H	With terminal	TO220	STMicroelectronics			Not assembled
Q2-Q3	2STR1215		SOT/23	STMicroelectronics			
RT1	NTC 16 Ω	With terminal				216-1393	
R3,R5,R14,R16,R30,R32	1 kΩ 1/8 W 10%	1/8 W 10%	SMD/0805				
R2	22 kΩ 1/8 W 10%	1/8 W 10%	SMD/0805				
R4,R55	47 kΩ 1/8 W 10%	1/8 W 10%	SMD/0805				
R6,R7,R8,R9,R95,R96, R97,R101, R103	4.7 kΩ 1/8 W 10%	1/8 W 10%	SMD/0805				
R10,R26,R54,	560 Ω	1/8 W 10%	SMD/0805				
R11,R12,R13	2.4 kΩ 1/8 W 10%	1/8 W 10%	SMD/0805				
R15,R68	6.8 Ω 1/8 W 1%	1/8 W 1%	SMD/0805				
R17,R33	2 MΩ 1/8 W 10%	1/8 W 10%	SMD/0805				
R18	475 Ω 1/8 W 1%	1/8 W 1%	SMD/0805				

Table 2. BOM list (continued)

Reference	Part / value	Voltage / Watt	Footprint	Manuf.	Manuf. code	RS code	More info
R19,R20,R21	261 kΩ 1/4 W 1%	1/8 W 1%	Axial with terminal				
R22,R38	43 kΩ 1/8 W 10%	1/8 W 10%	SMD/0805				
R23,R39	100 Ω 1/8 W 1%	1/8 W 1%	SMD/0805				
R42	470 kΩ 1 W 10%	1 W 10%	Axial with terminal				
R43,R52	10 Ω 1/8 W 10%	1/8 W 10%	SMD/0805				
R44,R66,R67,R105,R111	0 Ω 1/8 W 10%	1/8 W 10%	SMD/0805				
R45	4.7 Ω 1/8 W 10%	1/8 W 10%	SMD/0805				
R47	47 Ω 1/8 W 10%	1/8 W 10%	SMD/0805				
R48	6.8 kΩ 1/8 W 10%	1/8 W 10%	SMD/0805				
R50	33 kΩ 1/8 W 10%	1/8 W 10%	SMD/0805				
R58,R102,R104	330 Ω 1/8 W 10%	1/8 W 10%	SMD/0805				
R56	27 kΩ 1/8W 10%	1/8 W 10%	SMD/0805				
R60,R87,R88,R89,R90, R92,R93, R94,R109, R106, R107	10 kΩ 1/8 W 10%	1/8 W 10%	SMD/0805				
R61	560 kΩ 1/8 W 10%	1/8 W 10%	SMD/0805				
R62,R63,R65,R110	100 kΩ 1/8 W 10%	1/8 W 10%	SMD/0805				
R31	100 Ω 1/8 W 10%	1/8 W 10%	SMD/0805				
R64	150 kΩ 1/8 W 10%	1/8 W 10%	SMD/0805				
R98	1.5 kΩ 1/8 W 10%	1/8 W 10%	SMD/0805				
R108	1 MΩ 1/8 W 10%	1/8 W 10%	SMD/0805				
SW1,SW2,SW3,SW4, SW5,SW6,SW7,SW8, SW9,SW10,SW12	Male stripline 3 pins						

Table 2. BOM list (continued)

Reference	Part / value	Voltage / Watt	Footprint	Manuf.	Manuf. code	RS code	More info
SW11,S1,S2	Vertical reset push button			Distrelec	200862		5 mm button
T1,T2	Current transformer		With terminal	VAC	4622-X503		
T3	Output transformer		With terminal	MAGNETCA	1155-0002		
U4,U5	STPM01			STMicroelectronics			
U6	VIPER12A			STMicroelectronics			
U9	STS4DNF30L			STMicroelectronics			
U8	PM6680			STMicroelectronics			
U11	STML75M2E			STMicroelectronics			
U12	STM32F103RBT6			STMicroelectronics			
Y1	SMD 32.768 kHz crystal		SMD			244-2018	
Y2	8 MHz HC49/4H crystal	Low profile	With terminal			226-1724	
K1	Relay 16 A 12 V	Low profile		OMRON		365-0535	

5 Revision history

Table 3. Document revision history

Date	Revision	Changes
31-Oct-2011	1	Initial release.

Please Read Carefully:

Information in this document is provided solely in connection with ST products. STMicroelectronics NV and its subsidiaries (“ST”) reserve the right to make changes, corrections, modifications or improvements, to this document, and the products and services described herein at any time, without notice.

All ST products are sold pursuant to ST’s terms and conditions of sale.

Purchasers are solely responsible for the choice, selection and use of the ST products and services described herein, and ST assumes no liability whatsoever relating to the choice, selection or use of the ST products and services described herein.

No license, express or implied, by estoppel or otherwise, to any intellectual property rights is granted under this document. If any part of this document refers to any third party products or services it shall not be deemed a license grant by ST for the use of such third party products or services, or any intellectual property contained therein or considered as a warranty covering the use in any manner whatsoever of such third party products or services or any intellectual property contained therein.

UNLESS OTHERWISE SET FORTH IN ST’S TERMS AND CONDITIONS OF SALE ST DISCLAIMS ANY EXPRESS OR IMPLIED WARRANTY WITH RESPECT TO THE USE AND/OR SALE OF ST PRODUCTS INCLUDING WITHOUT LIMITATION IMPLIED WARRANTIES OF MERCHANTABILITY, FITNESS FOR A PARTICULAR PURPOSE (AND THEIR EQUIVALENTS UNDER THE LAWS OF ANY JURISDICTION), OR INFRINGEMENT OF ANY PATENT, COPYRIGHT OR OTHER INTELLECTUAL PROPERTY RIGHT.

UNLESS EXPRESSLY APPROVED IN WRITING BY TWO AUTHORIZED ST REPRESENTATIVES, ST PRODUCTS ARE NOT RECOMMENDED, AUTHORIZED OR WARRANTED FOR USE IN MILITARY, AIR CRAFT, SPACE, LIFE SAVING, OR LIFE SUSTAINING APPLICATIONS, NOR IN PRODUCTS OR SYSTEMS WHERE FAILURE OR MALFUNCTION MAY RESULT IN PERSONAL INJURY, DEATH, OR SEVERE PROPERTY OR ENVIRONMENTAL DAMAGE. ST PRODUCTS WHICH ARE NOT SPECIFIED AS "AUTOMOTIVE GRADE" MAY ONLY BE USED IN AUTOMOTIVE APPLICATIONS AT USER’S OWN RISK.

Resale of ST products with provisions different from the statements and/or technical features set forth in this document shall immediately void any warranty granted by ST for the ST product or service described herein and shall not create or extend in any manner whatsoever, any liability of ST.

ST and the ST logo are trademarks or registered trademarks of ST in various countries.

Information in this document supersedes and replaces all information previously supplied.

The ST logo is a registered trademark of STMicroelectronics. All other names are the property of their respective owners.

© 2011 STMicroelectronics - All rights reserved

STMicroelectronics group of companies

Australia - Belgium - Brazil - Canada - China - Czech Republic - Finland - France - Germany - Hong Kong - India - Israel - Italy - Japan - Malaysia - Malta - Morocco - Philippines - Singapore - Spain - Sweden - Switzerland - United Kingdom - United States of America

www.st.com